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Microsoft Windows CE Platform Builder 3.0: Getting Started

Microsoft Corporation

May 2000

Summary: This step-by-step guide demonstrates how to make and boot a Microsoft® Windows® CE operating system, how to create a Windows CE component that you can add to an operating system to customize it, and how to export an SDK. The guide also includes information about building a Windows CE–based PC hardware development platform (CEPC). (23 pages)

Contents

Introduction

Microsoft Windows CE Platform Builder 3.0 is a tool for building customized Windows CE-based operating systems for embedded system devices. Platform Builder contains the latest version of the Windows CE operating system, a set of embedded development tools, an integrated development environment (IDE), support for the Microsoft run-time libraries, and sample code. The following table shows the main features of Platform Builder.

Feature	Description
Windows CE operating system	Eight configurations of the Windows CE operating system ranging from a system with little more than a kernel to a robust system complete with a rich graphical user interface (GUI) and preloaded applications.
Integrated development environment	An integrated, intuitive user interface (UI) that includes wizards and toolbars for designing platforms and components, a full set of resource editors and compilers, a kernel debugger, connectivity and download support, integrated hardware debugging support, add-in central processing unit (CPU) configuration support, and the Windows CE remote tools.
Export software development kit tool	A tool for creating and exporting a compressed, self-extracting executable file containing a custom software development kit (SDK) for your platform. Application developers can import your SDK into Microsoft® eMbedded Visual C++® 3.0 or Microsoft® eMbedded Visual Basic® 3.0 and create applications for your platform.

Run-time library support — Optional support for the Microsoft run-time libraries, including Microsoft® Foundation Classes (MFC) for Windows CE, Active Template Library (ATL) for Windows CE, and Microsoft® Visual Basic® for Windows CE.

Component development tools — A set of tools that enable you to build custom components for your platform, including device drivers, applications, dynamic-link libraries (DLLs), and static libraries.

This guide also provides the hardware and software requirements for Platform Builder, and explains how to install it.

Installing Platform Builder 3.0

Platform Builder is distributed on multiple compact discs (CDs). If you accept the default option of registering the environment variables while you install Platform Builder, the Platform Builder setup application—Setup.exe—defines the system environment variable _WINCEROOT, which is required for the build process.

During installation, Setup.exe copies the Platform Builder files to the directories you specify. One directory is for the IDE, and one directory is for the operating system. As well, during setup the program group Microsoft Windows CE Platform Builder 3.0 is added.

Hardware and Software

The following are the hardware and software requirements and recommendations for the system on which you wish to install Platform Builder:

- A desktop computer with an x86-based microprocessor supported by Windows 2000 or Windows NT 4.0 with Service Pack SP3 and later (SP5 or SP6 recommended).

  If you are using Windows NT®, Microsoft Data Access Components (MDAC) must be installed on your computer. If MDAC is not installed on the computer, Setup.exe will install it for you.

  If you are not using the worldwide English (WWE) edition of Windows NT Workstation version 4.0, you can install a localized version of Service Pack 5 (SP5) from this Microsoft Web site: http://www.microsoft.com/ntserver.

- 64 megabytes (MB) of RAM
- 1.36 gigabytes (GB) of available hard disk space for a typical, single microprocessor installation or 7.8 GB for installation of the entire Platform Builder product
- A CD-ROM drive or DVD-ROM drive that is compatible with the multimedia desktop computer specification
- A monitor with video graphics adapter (VGA) or higher resolution; super VGA is recommended
- A Microsoft Mouse pointing device or compatible pointing device
- A bi-directional parallel port is required if you want to download an operating system image and are not using an Ethernet connection.
- A serial port or Ethernet network card for debugging support; a local area network (LAN) hub is recommended.

If your system meets the requirements listed above, you are ready to install Platform Builder.

To install Platform Builder

1. Log on to the development workstation as a user with administrator privileges. Use the same user credentials that will be used when logging on to the development workstation to use Platform Builder.
2. Run Setup.exe from the root directory on the Platform Builder disk 1 CD.
3. When the **Welcome** dialog box appears, follow the on-screen instructions.

> **Note** To reduce the installation size of Platform Builder, you can deselect the microprocessors you do not need in the **CPU Selection** dialog box and deselect options in the **Custom Options** dialog box. To use the procedures outlined in this paper, you will need to install the x86 microprocessor.

To access the **Custom Options** dialog box, choose the **Options** button in the **CPU Selection** dialog box.

Building and Customizing a Platform

Platform Builder is a tool for developing custom Windows CE-based operating systems for embedded system devices. The development process involves building a basic platform, customizing the platform, and downloading the operating system image to a target device.

To build a basic platform, you configure the platform, make an operating system image, transfer the platform to a target device and debug the platform. To customize the platform, you can develop your own OEM adoption layer (OAL), device drivers, boot loader, and components, localize and profile the platform, and export a software development kit (SDK).

A platform consists of core Windows CE components from a Windows CE configuration, as well as an OAL and device drivers from a selected board support package. The OAL is a layer between the Windows CE kernel and the firmware of the target device. The boot loader is used to download code from the development workstation to a target device, and to monitor and debug the target device.

A hardware development platform is a type of target device that simulates a variety of embedded system devices. The hardware development platform is used to develop, test, and certify the quality of the platform. Platform Builder supports two hardware development platforms: the Hitachi D9000, known as ODO, and the PC-based hardware development platform, known as CEPC. See the Appendix for information about building a CEPC.

This sections demonstrates the following tasks using Platform Builder:

- Build a basic platform
- Transfer and boot the OS.
- Use kernel debugger

- Customize a platform by creating and building a user component.
- Export a software development kit (SDK).

The tutorial assumes that when you installed Platform Builder you selected the x86 microprocessor, accepted the default option of registering the environment variables, and installed Platform Builder in the default directory provided by Setup.exe. This tutorial also assumes that you are using the CEPC, with the recommended configuration, for your hardware development platform, an Ethernet connection for downloading and debugging the OS image, and Windows NT Workstation version 4.0 OS.

> **Note** Once you have opened the Platform Builder application, allow it to remain running on the development workstation during the tutorial.

For more information about the recommended configuration for a CEPC, see "Assembling a CEPC" in the Appendix.

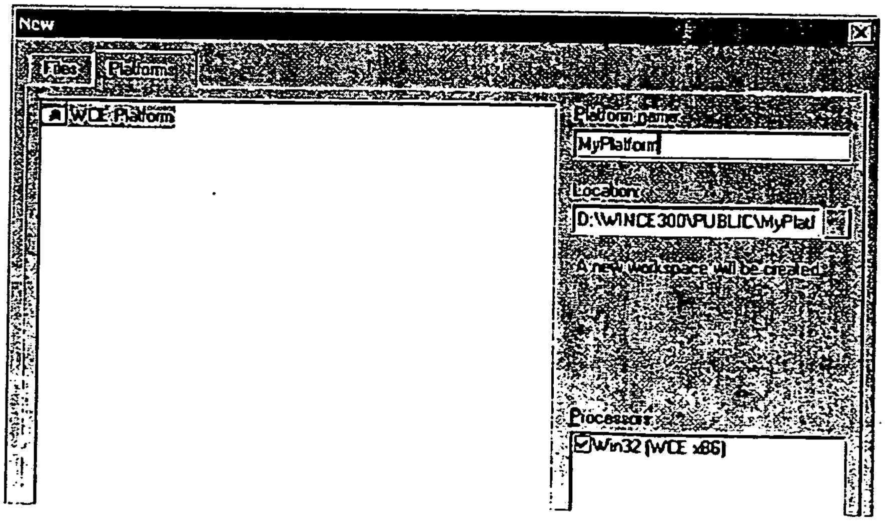
Building a Basic Platform

To build a basic platform, you configure the platform using the Platform Wizard and make an OS image based on the platform. In this tutorial, you create a platform that includes core Windows CE components from the Maxall configuration, review the platform settings in order to verify that the kernel debugger is enabled, and then use the Platform Builder IDE to make the OS image.

The kernel debugger provides several options for debugging code in the Microsoft Windows CE kernel as well as Windows CE–based applications. The kernel is the main module of the OS. The kernel provides system services for managing threads, memory, and resources.

To create a platform

1. On the development workstation, click **Microsoft Windows CE Platform Builder** in the program group **Microsoft Windows CE Platform Builder 3.0** to open the Platform Builder application.
2. Click **New** on the **File** menu. The **New** dialog box appears. Type a name for your platform in the **Platform name** text box. For this tutorial, type **MyPlatform** (see figure 1).



Platform name:
MyPlatform

Location:
D:\WINCE300\PUBLIC\MyPlat

A new workspace will be created

Processors:
☑Win32 (WCE x86)

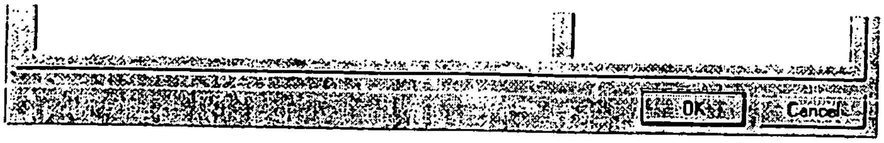


Figure 1. The New dialog box

3. You can type a new path for the platform in the **Location** text box.
4. Select one or more microprocessors that your platform will support in the **Processors** box. The **Processors** box lists only the microprocessors you installed. For this tutorial, select the x86 microprocessor.
5. Click **OK**. **The WCE Platform - Step 1 of 2** dialog box appears.
6. Select a board support package from the list. For this tutorial, select **CEPC** to add the preconfigured CEPC board support package to your platform. The list only includes the board support packages that support the microprocessors you selected. The list of support microprocessors is defined in the component (.cec) file for each board support package. If no board support package supports any of the selected microprocessors, only the **No BSP** and **My BSP** options are displayed.
7. Click **Next**. The **WCE Platform - Step 2 of 2** dialog box appears.
8. Select one of the configuration options. For this tutorial, select **Maximum OS (Maxall)** in order to build the most robust Windows CE configuration.
9. Click **Finish**. The **New Platform Information** dialog box appears. The dialog box displays information about your configuration including the language setting for the platform. By default, the Platform Wizard uses the language setting established for the development workstation.
10. Click **OK** to close the **New Platform Information** dialog box and complete the creation of the platform. The **ComponentView** window displays the platform components.

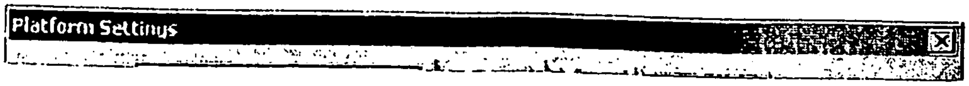
Note The platform you have created is included in a workspace. This workspace needs to remain open throughout the tutorial.

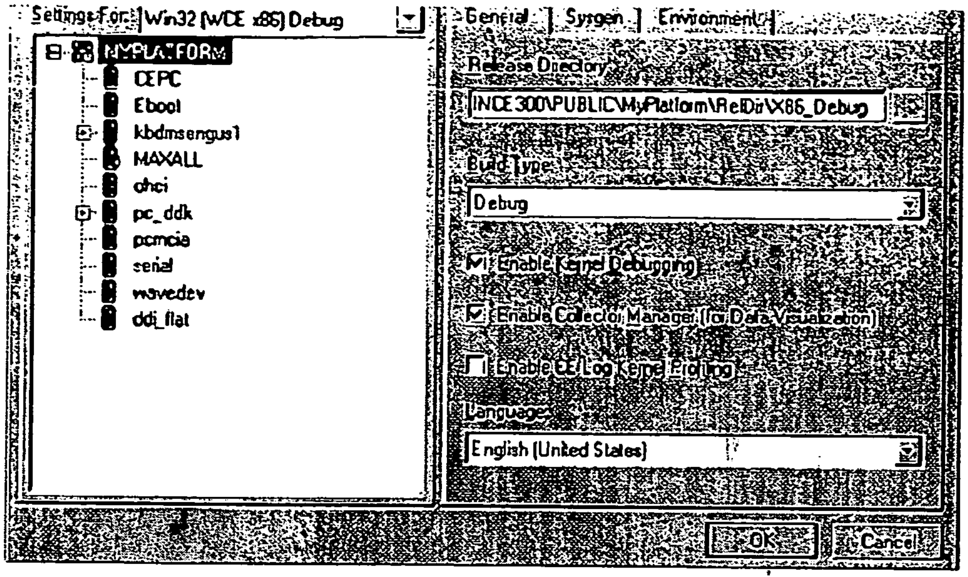
The next step is to create an operating system image with the kernel debugger enabled, as described in this next procedure.

To make an operating system image with the kernel debugger enabled

1. When you create a platform, both a debug configuration and a release configuration are automatically created. Therefore, in the Platform Builder application, confirm that the **Win32 (WCE x86) Debug** configuration is selected in the **Select Active Configuration** list on the **Build** toolbar.
2. In the Component View window, right-click on the platform youÂ,Â’ve just created and then choose **Settings** on the context menu.

   Or, click **Settings** on the **Platform** menu. The **Platform Settings** dialog box appears (see figure 2).





Settings For: Win32 (WCE x86) Debug

- MYPLATFORM
  - CEPC
  - Eboot
  - kbdmsengus1
  - MAXALL
  - ohci
  - pc_ddk
  - pcmcia
  - serial
  - wavedev
  - ddi_flat

Release Directory: INCE300\PUBLIC\MyPlatform\RelDir\X86_Debug

Build Type: Debug

☑ Enable Kernel Debugging

☑ Enable Collector Manager (for Data Visualization)

□ Enable CE/Log Kernel Profiling

Language: English (United States)

Figure 2. The Platform Settings dialog box

3. Confirm that the **Win32 (WCE x86) Debug** configuration is selected in the **Settings For** drop-down list box.

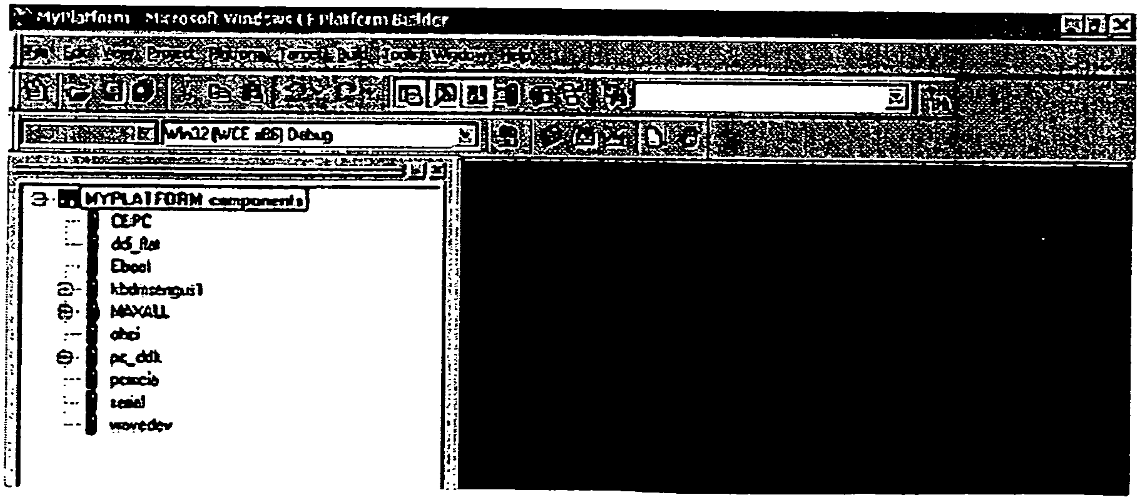
   When the debug configuration is selected, by default the **Enable Kernel Debugging** check box is selected in the **General** tab.

4. Click **OK** to close the **Platform Settings** dialog box.

5. If your CEPC video card is supported by the Flat driver, which is the default display driver when you create a platform, select **Build Platform** from the **Build** menu.

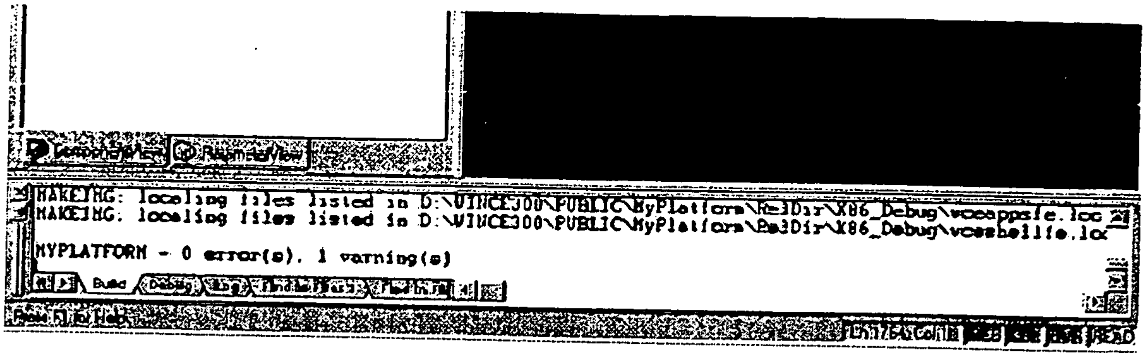
   Otherwise, if your CEPC video card is not supported by the Flat driver, select **ddi_flat** in the **ComponentView** window and then click **Delete** on the **Edit** menu. Next, click **Catalog** on the **View** menu, right-click **ddi_vga8** in the **Catalog**, and choose **Add to Platform**. The ddi_vga8 display driver is added to your platform (see figure 3). Then, select **Build Platform** from the **Build** menu.

   It takes five to ten minutes to complete the build. When the build is complete, data appears in the build window.



Win32 (WCE x86) Debug

- MYPLATFORM components
  - CEPC
  - ddi_flat
  - Eboot
  - kbdmsengus1
  - MAXALL
  - ohci
  - pc_ddk
  - pcmcia
  - serial
  - wavedev



```
MAKEIMG: localizing files listed in D:\WINCE300\PUBLIC\MyPlatform\RelDir\X86_Debug\wceappsfe.loc
MAKEIMG: localizing files listed in D:\WINCE300\PUBLIC\MyPlatform\RelDir\X86_Debug\wceshellfe.loc

MYPLATFORM - 0 error(s), 1 warning(s)
```

Figure 3. The Platform Builder build window

Transferring and Booting an Operating System

Now that you have created a platform and made the operating system image, you are ready to transfer and boot the operating system image. In this tutorial, the operating system image is transferred from the development workstation into system memory on a CEPC. It is then booted using a boot loader application on a boot floppy disk created for a CEPC; a CEPC does not require a hard drive. Typically, a CEPC is connected to a development workstation using an Ethernet or parallel connection, and an operating system image is downloaded to the CEPC using the Ethernet connection. In this tutorial, you use the Ethernet card for connection and downloading.

Setting Up the CEPC

Before transferring and booting an operating system image on a CEPC, you need to set up the CEPC. The first step is installing and configuring the hardware. For more information about the hardware configuration for a CEPC, see the appendix at the end of the paper titled "Building a CEPC."

Once you have installed and configured the CEPC hardware, create a boot disk and configure the interrupt request (IRQ) line, I/O Base, and Internet Protocol (IP) settings. It is important that you use the boot loader that is included with Platform Builder 3.0.

To create a boot floppy disk for a CEPC

1. Run **Websetup.exe**, located in the **Program Files\Windows CE Platform Builder\3.0\CEPB\Utilities** directory. By default, this application installs Webimgnt.exe in C:\Winnt.
2. Run Cepcboot.144, a disk image file that is located in the Program Files\Windows CE Platform Builder\3.0\CEPB\Utilities directory.

   The **Web Image NT** dialog box appears.
3. Insert a floppy disk into the floppy drive on your development workstation, and then choose either **Disk A** or **Disk B** to specify the floppy disk drive used to create the book disk.
4. Click **Cancel** after the boot disk has been created.
5. Verify that the boot disk contains the correct files.

The following table lists the files that the boot disk contains.

Files	Description
Eboot.bin	This is a binary file (.bin). The file is an Ethernet boot loader component.
Loadcepc.exe	This is an executable file (.exe). The file loads the boot loader image Eboot.bin.
Autoexec.bat, Config.sys, Himem.sys, and Command.com	Autoexec.bat is a batch application file (.bat). All of these files are required MS-DOS files.
Readme.txt	This file contains booting instructions.
Drvspace.bin	This .bin file adjusts the settings in the Drvspace.ini file to mount a drive.
Io.sys and Msdos.sys	These are system files.
Sys.com	This file is an MS-DOS application.
Vesatest.exe	This is a DOS .exe file. It tests the VGA BIOS on the video card to ensure that it is compatible with the Windows CE 3.0 default display driver. The Readme.txt file included on the boot floppy disk provides additional information.

The Autoexec.bat, Eboot.bin and Loadcepc.exe files are updated in this release of Windows CE version 3.0. These files make it possible to do the following:

- Easily enter and modify the IRQ, I/O base address, and static Internet Protocol (IP) settings in Autoexec.bat.
- Use the Loadcepc.exe /L switch to pass additional parameters to the FLAT display driver in order to set arbitrary resolutions. This driver is the default display driver.
- Use the boot floppy disk more reliably with different types of Dynamic Host Configuration Protocol (DHCP) servers.
- Support warm booting of a CEPC from the Windows CE Debug Shell tool (Eshell.exe)
- Support improved Peripheral Component Interconnect (PCI) local bus enumeration on the CEPC
- Use static IP addresses to boot a CEPC when a DHCP server is not available to automatically provide IP addresses.
- Download an operating system image from Platform Builder versions 2.11 and 2.12.

To configure the IRQ, I/O Base, and IP settings

It is recommended that you read the Readme.txt file, located on the boot floppy disk, for more information about editing the Autoexec.bat file in order to configure the correct settings for the debug Ethernet card. A debug Ethernet card is used for debugging and downloading.

Set **NET_IRQ** to **5** and **NET_IOBASE** to **340** in the Autoexec.bat file and configure the Ethernet network card to use these settings. These are the settings for an ISA-based Linksys Ethernet card, which is the suggested Ethernet card for Ethernet debugging. (*Ethernet debugging* refers to a method of connecting a development workstation to a target device using a standard Ethernet connection in order to debug the target device.)

If the IRQ and I/O Base settings listed in the Autoexec.bat do not match the Ethernet card settings, you can either edit Autoexec.bat or use the Ethernet card configuration program to change the card's settings.

The following table provides recommended IRQ and I/O Base settings for Autoexec.bat when an ISA-based Ethernet card is used.

Code example	Description

`set NET_IRQ=5`
`set NET_IOBASE=340`
`set NET_IP=`
	Use these settings if you are using an ISA-based debug Ethernet card, such as a Linksys Ether16 LAN card, model number LNE2000, and a DHCP server. Because a DHCP server provides IP addresses automatically in the network environment, the NET_IP setting is left blank.

`set NET_IRQ=5`
`set NET_IOBASE=340`
`set NET_IP=`*`valid IP address`*
	Use these settings if you are using an ISA-based debug Ethernet card, such as a Linksys Ether16 LAN card, model number LNE2000, without a DHCP server.
	An example of a valid IP address is 151.128.1.10; however, use an IP address that is valid for your network environment. Use the subnet mask that applies to the development workstation, and obtain an unused IP address from your network administrator.

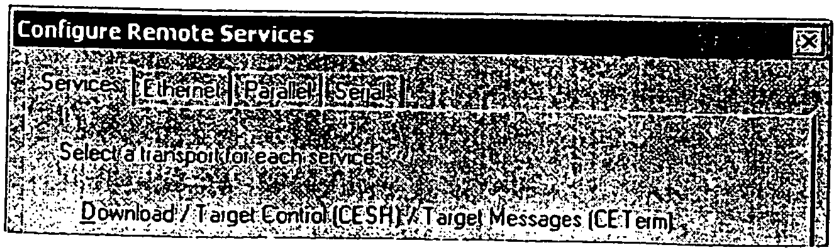
Transferring and Booting the Operating System Image

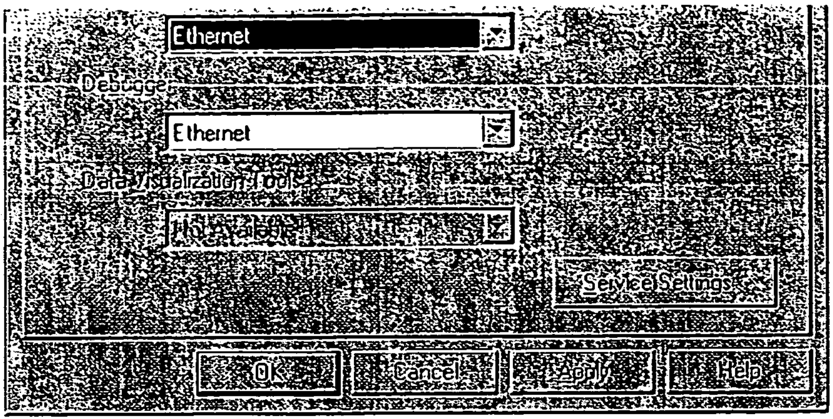
Once you have created the boot disk, configure the connection between the development workstation and the target device in order to transfer and boot the operating system image. To transfer the image, download the Windows CE binary image file, Nk.bin.

In the next procedure, you configure an Ethernet connection to download and boot the operating system image.

To configure the Ethernet connection

1. In the Platform Builder application, select **Configure Remote Services** on the **Target** menu. The **Configure Remote Services** dialog box appears (see figure 4).


Configure Remote Services
Services
Ethernet
Parallel
Serial
Select a transport for each service:
Download / Target Control (CESH) / Target Messages (CE Term)



Ethernet

Debugger

Ethernet

Data Visualization Tools

Not Available

Figure 4. The Configure Remote Services dialog box

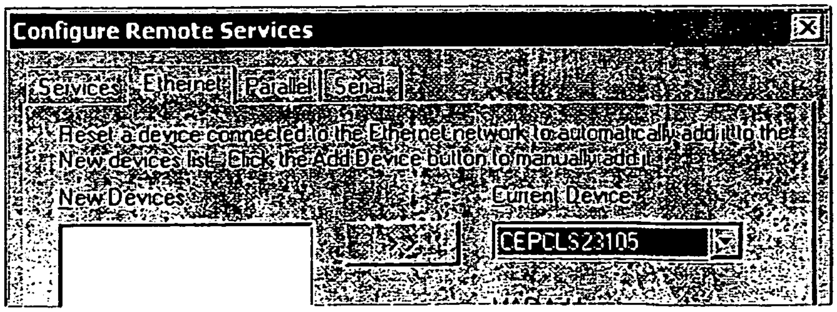
2. Select **Ethernet** in the **Download / Target Control (CESH) / Target Messages (CETerm)** and the **Debugger** drop-down list boxes.
3. Click the **Service Settings** button. The **Service Settings** dialog box appears. Review the settings. The **Start on Download** check boxes for Target Messages (CETerm) and **Target Control (CESH)** are selected by default. Consequently, Platform Builder automatically starts these services, as well as kernel debugger if required, after the operating system image is downloaded.
4. Click **OK** to close the **Service Settings** dialog box.
5. Select the **Ethernet** tab.
6. Insert the boot floppy disk into the CEPC floppy drive, and then boot the CEPC. During the CEPC boot the Startup Menu dialog box is displayed on the CEPC screen with a list of options. You do not need to select an option.

   When the CEPC is finished booting, the following message appears on the CEPC screen: **Jumping to *address***. The CEPC device name appears in the **New Devices** box in the **Ethernet** tab in the **Configure Remote Services** dialog box.

   > **Note** If the CEPC device name does not appear in the **New Devices** box, reboot the CEPC.

   If after rebooting the CEPC the device name still does not appear in the New Devices box, verify that you have correctly configure the IRQ and I/O base address settings in the Autoexec.bat file.

7. Select your device name and then select the arrow button. The device name appears in the **Current Device** box (see figure 5).



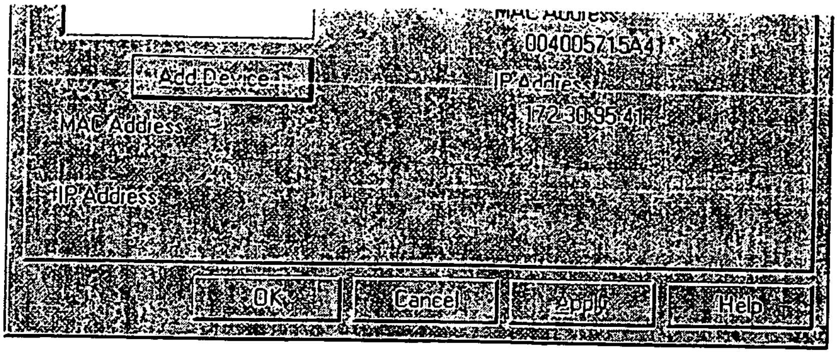
Configure Remote Services

Reset a device connected to the Ethernet network to automatically add it to the New devices list. Click the Add Device button to manually add it.

New Devices

Current Device

CEPCLS23105



MAC Address
004005215A41
IP Address
172.30.95.41
MAC Address
IP Address

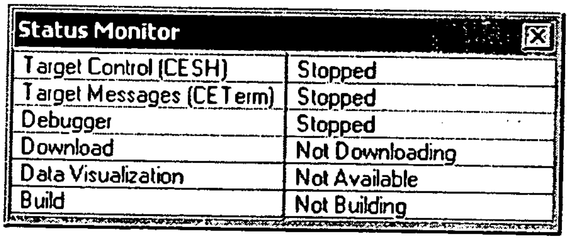
Figure 5. The Configure Remote Services dialog box, Ethernet tab

8. Click **OK** to close the **Configure Remote Services** dialog box.

After you have configured the Ethernet connection, you can download and boot the operating system image.

To download and boot the operating system image

1. Verify that the **MyPlatform** platform is displayed in the **ComponentView** window in the Platform Builder application.
2. Click **Status Monitor** on the **Target** menu. The **Status Monitor** window appears. This window keeps track of the state of processes on your target device.
3. Click **Download Image** on the **Target** menu. The **Status Monitor** window indicates that the Target Control (CESH), Target Messages (CETerm), and debugger are stopped (see figure 6).



Status Monitor

Target Control (CESH)	Stopped
Target Messages (CETerm)	Stopped
Debugger	Stopped
Download	Not Downloading
Data Visualization	Not Available
Build	Not Building

Figure 6. The Status Monitor window

4. Click **OK** in the message box when the following message is displayed: **Reset target device to begin Download.**
5. Reboot the CEPC.

   While the CEPC is rebooting, the following message appears at the bottom of the Platform Builder application: **Waiting to receive a download message.**
   Once the CEPC has rebooted, two events occur during the process of downloading and booting the OS image: First, a download progress bar appears at the bottom of the Platform Builder application, and the **Status Monitor** window indicates that the download is in progress. Second, when the download is completed, information is displayed in the **Debug** window. The **Status Monitor** window indicates that the Target Control (CESH), Target Messages (CETerm), and debugger are running.

> **Note** Platform Builder is automatically running these services because the **Target Messages (CETerm)** and the **Target Control (CESH)** services were selected in the **Service Settings** dialog box prior to downloading the operating system image.

When the image has successfully booted, the Windows CE operating system is displayed on the CEPC screen.

Using Kernel Debugger

Now that you have downloaded and booted the operating system image, you can debug it. **Enable Kernel Debugging** and **Target Messages (CETerm)** were selected before downloading (in the procedure above), and thus the kernel debugger is available and Platform Builder automatically starts it when the operating system is booted. The **Debug** toolbar appears (see figure 7).

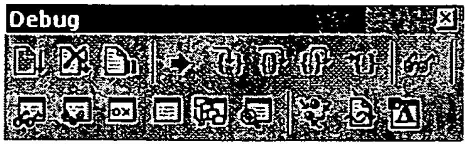


Figure 7. The Debug toolbar

The kernel debugger provides several options for debugging code in the Microsoft Windows CE kernel as well as Windows CE–based applications. The kernel is the main module of the operating system. In Platform Builder 3.0 the debugger user interface includes dockable processes, threads, modules, symbols, call stack windows, and a new **Debug Zones** dialog box.

To stop kernel debugging

- In the Platform Builder application, click **Stop Debugging** on the **Debug** menu. This returns control to Platform Builder.

Customizing a Platform

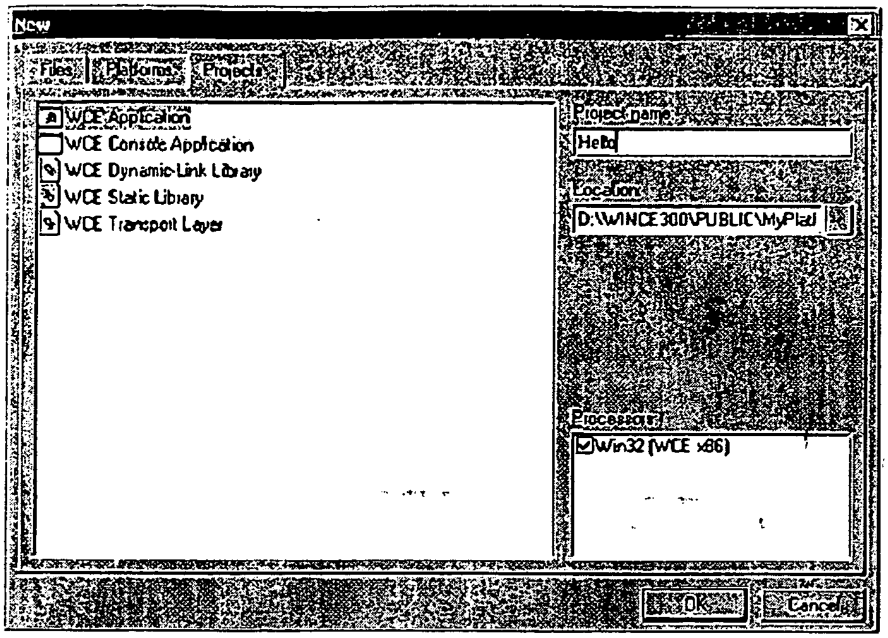
There are several different options for customizing a platform, including adding a board support package, creating an OEM Adaptation Layer (OAL), using an add-in CPU configuration, localizing a platform, creating a boot loader, and adding and removing components.

The next procedure details how to create a user component using the Project Wizard in Platform Builder and then build the component. A *component* is a group of related functions that implements a particular feature of the operating system. A user component is a component that you create.

To create and build a user component

1. In the Platform Builder application, click **New** on the **File** menu.
2. The **New** dialog box appears; select the **Projects** tab and then select a type of user component to create. For this procedure, select **WCE Application**.
3. Type the component name in the **Project Name** box. For this tutorial type **Hello** see figure

8).



Project name: Hello

Location: D:\WINCE300\PUBLIC\MyPlat

Processors: ☑ Win32 (WCE x86)

Figure 8. The New dialog box, Projects tab

4. If desired, change the location for your project files in the **Location** box. By default, the files are located in a subdirectory of the platform directory.
5. Select the applicable microprocessors for your component in the **Processors** box. The **Processors** box lists the installed microprocessors. By default, the processors you selected for the current platform are selected. For this tutorial verify that the **Win32 (WCE x86)** microprocessor is selected.
6. Click **OK**.

   Or, if your platform is currently running on the CEPC, click **OK** when the following message is displayed: **This command will stop all running services**. These services can only be restarted if the target device is reset.

   The **WCE Application – Step 1 of 1** dialog box appears, displaying the options for the WCE application. The options provided vary depending on type of component that is selected in the **New** dialog box.

7. Select **A typical Ã‚Â“Hello World!Ã‚Â” application**, and then click **Finish**. The **New Project Information** dialog box appears and lists the specifications of your new user component.
8. Click **OK** to close the dialog box and finish creating the user component. The **ClassView** window displays the project classes.
9. Click **Build Hello.exe** on the **Build** menu to build the user component.

   The Hello.exe file is copied to the directory %_FLATRELEASEDIR%.

Exporting an SDK

Once you have customized your platform, and booted and debugged the operating system, you may decide to provide support for the development of additional applications. To allow developers to write applications for your target platform, you can use Platform Builder to create a software development kit (SDK). Once you create the SDK, you can move or export your SDK to a computer.

An SDK is a set of library, header, and Help files that developers use to write applications for a specific platform. To create, debug, and run custom applications, other developers can use your SDK in conjunction with Microsoft® eMbedded Visual Tools® 3.0, which includes Microsoft eMbedded Visual Basic 3.0 and Microsoft eMbedded Visual C++ 3.0.

In this procedure, you create and export an SDK for eMBedded Visual Basic 3.0.

To create and export an SDK for eMbedded Visual Basic 3.0

1. Create the components to include in the SDK.
2. In the Platform Builder application, click **Export SDK** on the **Platform** menu.
3. Click **eMbedded Visual Basic** on the **Export SDK** menu.
4. Type the location of your license agreement in the **Software License Agreement** text box of the **Add Software License Agreement** dialog box. Or click **Browse** to browse for the location of your license agreement, and then click **Next**.

   Platform Builder automatically includes a license agreement, which is necessary to protect the intellectual property rights of Microsoft components. You must also add your own license agreement. Platform Builder attaches any additional license agreement to the end of the Microsoft license agreement. Your license agreement must be saved as a text file (.txt).

5. Specify whether your platform supports GWE (graphics, window manager, event manager), and whether the SDK supports Visual Basic Forms and additional Microsoft ActiveX® controls by checking the boxes on the **Export Windows CE SDK - Select Configuration** dialog box. As well, specify the languages that your platform supports, and then click **Next.**
6. Select the transport that applies to your platform by checking the appropriate box on the **Export Windows CE SDK - Select Platform Manager Options** dialog box, and then click **Next**.

   You can add a custom transport by clicking **Add** or view and change details about the selected transport by clicking **Details.**

7. Specify a directory in which to place the completed SDK on the **Export Windows CE SDK - Installation** dialog box, and then click **Next.**
8. Click **Finish** on the **Export Windows CE SDK** dialog box to complete the export process.

For More Information

For the latest information, check out our Windows 2000 Web site and the Windows 2000/NT Forum online documentation and context-sensitive Help included with Platform Builder provide comprehensive background information and instructions for using Platform Builder.

To access the online documentation for Platform Builder

1. Start Platform Builder.
2. Select the **Contents** tab on the **Help** menu to view the documentation.

Microsoft Technical Support

You can find information about documentation and technical information updates in the online documentation.

In addition, Microsoft offers technical support and services ranging from self-help tools to direct assistance from a Microsoft technical engineer.

To view technical support in online Help

- Install the documentation and then select Technical Support from the Platform Builder Help menu.

A Help page entitled Getting Help from Microsoft Technical Support is displayed. This page contains links to a variety of technical support topics.

If you receive an error message instructing you to install MSDN, ignore it and install the documentation instead.

To view technical support information on the Web

1. Navigate to the Microsoft Personal Support Center Web page at http://support.microsoft.com/support.
2. Click the **Phone Numbers** link in the left frame of the Web page.
3. Select **Windows CE Platform Builder** from the **Select a Microsoft Product** list, and then click the **Go** button.
4. The support page for the Platform Builder opens.

Appendix: Building a CEPC

This section recommends specific hardware components and configurations for building and configuring a CEPC. You can use other basic input/output systems (BIOS), motherboards, and configurations to build a CEPC. If you use different hardware, you must set up the BIOS and hardware configuration to match the Windows CE operating system. For this reason, Microsoft suggests that you use the recommended CEPC hardware components and configurations.

Hardware for a PC-Based Platform

A microprocessor, a display card, and other peripherals are required to build a CEPC. CEPC components are off-the-shelf products. The following table lists the required CEPC hardware.

Product	Description
Motherboard	Asus P5A Super Socket7
Microprocessor	AMD K5/K6-2 or Pentium P5 microprocessor
Case	Enlight ATX 250W
Memory	Minimum of 32 MB
Video card	ATI Expert128 (uses ATI Rage128 chipset)
Debug Ethernet card for Ethernet downloading and *Ethernet debugging*.	Linksys Ether16 ISA LAN card, Model LNE 2000, or you can use any ISA-based NE2000 compatible network adapter.
Other	A floppy disk, heat sink, and fan

An Ethernet connection is recommended because it is easier to set up and use, and is faster and more reliable than a serial or parallel port connection. However, you may choose to use a parallel port connection that would require an add-on parallel port card. For more information about using the parallel port for downloading and debugging, see the online documentation.

The hardware described in the preceding table is sufficient to boot a Windows CE operating system image on a CEPC. However, based on the type of development or testing that you do, you can use additional hardware. The following table lists the optional CEPC hardware.

Product	Description
Product Ethernet card (for general data access, such as Web browsing and synchronizing with a host computer)	Kingston EtherRX PCI Ethernet Adapter, model KNE30T, or any PCI-based NE2000 compatible network adapter.
PC card controller	SimpleStation PC Card socket adapter, from Simple Technology Inc., or any Intel 82365 chipset-based controller can be used.
Universal serial bus (USB) controller	An Open Host Controller Interface (OHCI) controller is built into the Asus P5A motherboard, or, any add-in UHCI PCI card.
Fast infrared (FIR) controller	ActiSys FastIR card model ACT-IR2000B or Temic Fast IR card model TFDU6100E/TFDS6500E.
Audio card	Sound Blaster AWE64 Plug and Play card

Motherboard and Card Configuration

Consult the motherboard documentation for information on installing the motherboard, the jumper settings for the microprocessor, system memory, and other system configurations. The following table shows a recommended hardware configuration for a CEPC based on the Asus P5A motherboard.

Slot number	Card/Adapter	Interrupt (IRQ)	I/O base	Comments
AGP video slot	ATI Expert 128	N/A	None	Required only if a PCI-based display card is not used in slot 1.

PCI slot 1	ATI Expert 128	N/A	None	Required. See comments for AGP video slot.
PCI slot 2	Kingston KNE 30T Ethernet card for product Ethernet.	0	0*	Required
PCI slot 5 or ISA slot 1	SimpleStation ISA adapter from Simple Technology Inc.	11	0x3E0	Optional
ISA slot 2	Linksys LNE2000 Ethernet card for Ethernet debugging	5	0x340	Optional
Built-in COM1		4	0x3f8	Defaults to debug serial port
Built-in COM2	COM1	3	0x2f8	
Built-in LPT1	LPT1	7	0x278	Set to ECP mode
Built-in USB		15		OHCI controller
Built-in audio			220-22f	
Built-in keyboard and mouse		1		

*For a PCI-based network card, the NE2000 Ethernet driver in Windows CE automatically chooses an appropriate interrupt and I/O base address that can be used with the card.

BIOS Settings

This section provides the BIOS settings that you must set on the Award Modular BIOS version 1.20, which is built into the Asus P5A motherboard. Your settings may differ if the BIOS version on your computer is different.

In general, the only changes you need to make in the BIOS are in the **PnP and PCI Setup** menu. You can choose the default settings for most of the other menus.

Standard CMOS Setup Menu

Choose the default CMOS settings in the BIOS.

Features Setup Menu

Choose the following settings on the **Features Setup** menu in the BIOS. The settings listed in the following table are the default settings.

Option	**Setting**
Boot virus detection	Disabled
PCI/VGA palette snoop	Disabled
CPU internal cache	Enabled
Video ROM BIOS shadow	Enabled
External cache	Enabled
C8000–CBFFF shadow	Disabled
Quick power on self test	Enabled

CC000–CFFFF shadow	Disabled
HD	
D0[illegible]FFF shadow	Disabled
Boot sequence	A/C
D4000D7FFF shadow	Disabled
Boot up floppy seek	Enabled
D8000–DBFFF shadow	Disabled
Floppy disk access control	Read only
DC000–DFFFF shadow	Disabled
IDE HDD block mode sectors	Disabled
Boot up numlock status	On
HDD S.M.A.R.T capability	Disabled
Typematic rate setting	Disabled
PS/2 mouse function control	Enabled
Typematic rate (Chars/Sec)	6

```
ERROR: syntaxerror
OFFENDING COMMAND r OS/2 onboa
STACK:
```